UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/620,205	07/15/2003	Joseph Smart	2867-205	8731

27820 7590 12/16/2004

WITHROW & TERRANOVA, P.L.L.C.
P.O. BOX 1287
CARY, NC 27512

EXAMINER	
NADAV, ORI	

ART UNIT	PAPER NUMBER
2811	

DATE MAILED: 12/16/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/620,205	SMART ET AL.	
	Examiner	Art Unit	
	ori nadav	2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 October 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *15-35* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *15-35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 15-23 and 26-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ogawa et al. (6,750,158) in view of Yonehara et al. (6,656,271) or Miyabayashi et al. (6,660,606).

Regarding claims 15-19 and 26-29 Ogawa et al. teach in figure 1 and related text a method of growing a gallium nitride (GaN) epitaxial structure and fabricating an electronic device comprising:

a) depositing a sacrificial epitaxial layer (column 3, lines 60-61) on a substrate 11;

b) depositing one or more structural epitaxial layers including a nucleation layer 12a and GaN buffer layer 12 on the sacrificial epitaxial layer; and

c) fabricating an electronic device on the structural epitaxial layers; and

d) separating the substrate from the one or more structural epitaxial layers.

Ogawa et al. do not explicitly state that the sacrificial epitaxial layer is separated from the substrate by oxidation.

Yonehara et al. teach an epitaxial layer is separated from a substrate by oxidation (column 37, lines 31-39).

Miyabayashi et al. teach an epitaxial layer is separated from a substrate by oxidation (column 4, lines 40-51).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to separate the sacrificial epitaxial layer from the substrate by oxidation, in Ogawa et al.'s device, in order to simplify the processing steps of making the device by using a known separating technique.

Regarding claims 20 and 30, Ogawa et al. teach in figure 1 and related text the one or more structural epitaxial layers comprise a barrier layer 13 and a cap layer 16 wherein the depositing the one or more structural epitaxial layers step comprises:

a) depositing the barrier layer 13 on the GaN buffer layer; and

b) depositing the cap layer 16 on the barrier layer.

Regarding claims 21-23 and 31-33, Ogawa et al. teach in figure 8E and related text

a) forming an ohmic source contact 71 on the cap layer 65;

b) forming an ohmic drain contact 72 on the cap layer and

c) forming a gate contact 73 on the cap layer between the source contact and the drain

contact,

wherein the source, gate, and drain contacts are separate contacts; and depositing the insulation layer on the GaN cap layer.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to form ohmic source, drain and gate contactson the cap layer, wherein the source, gate, and drain contacts are separate contacts; and depositing the insulation layer on the GaN cap layer, in Ogawa et al.'s device, in order to use the device in an application which requires an HFET device.

Claims 24 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ogawa et al., Yonehara et al. and Miyabayashi et al., as applied to claims 15 and 26 above, and further in view of Lee et al. (6,475,916). Ogawa et al., Yonehara et al. and Miyabayashi et al. teach substantially the entire claimed structure, as applied to claims 15 and 26 above, except oxidizing the sacrificial epitaxial layer with hydrogen peroxide. Lee et al. teach that hydrogen peroxide is a known oxidizing agent (column 6, lines 44-46). It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use hydrogen peroxide as the oxidizing agent, in prior art's device, in order to provide good oxidization of the sacrificial layer by a known oxidizing agent.

Claims 25 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ogawa et al., Yonehara et al. and Miyabayashi et al., as applied to claims 15 and 26 above, and further in view of Thakur (6,589,877).

Ogawa et al., Yonehara et al. and Miyabayashi et al. teach substantially the entire claimed structure, as applied to claims 15 and 26 above, except oxidizing the sacrificial epitaxial layer with steam. Thakur teaches that steam is a known oxidizing agent. It would have been obvious to a person of ordinary skill in the art at the time the invention was made to use steam as the oxidizing agent, in prior art's device, in order to provide good oxidization of the sacrificial layer by a known oxidizing agent.

Response to Arguments

Applicant argues that Ogawa et al. do not teach depositing a sacrificial layer on a substrate and oxidizing the sacrificial layer to separate the substrate from the one or more structural epitaxial layers deposited on the sacrificial layer.

The examiner agrees that Ogawa et al. do not teach the entire claimed method of depositing a sacrificial layer on a substrate and oxidizing the sacrificial layer to separate the substrate from the one or more structural epitaxial layers deposited on the sacrificial layer. That is, Ogawa et al. do not explicitly state that the sacrificial layer is separated from the substrate by oxidation. However, Yonehara et al. and Miyabayashi et al. teach oxidizing a sacrificial layer to separate the substrate from the one or more structural epitaxial layers. Therefore, combination of the references teaches the claimed structure.

Applicant argues that Ogawa et al. do not teach depositing a sacrificial layer on a substrate, because the buffer layer (not shown) is not oxidized or removed to separate the contact layer 12 from the substrate.

Claim 15 recites a) depositing a sacrificial epitaxial layer on a substrate;

b) depositing one or more structural epitaxial layers including a GaN buffer layer on the sacrificial epitaxial layer; and

d) oxidizing the substrate from the one or more structural epitaxial layers.

Ogawa et al. and Yonehara et al. and Miyabayashi et al. teach the entire claimed structure. Ogawa et al. deposits a sacrificial layer (buffer layer, not shown) on a substrate 11;

b) depositing one or more structural epitaxial layers including a nucleation layer 12a and GaN buffer layer 12 on the sacrificial epitaxial layer; and

d) separating the substrate from the one or more structural epitaxial layers.

Yonehara et al. and Miyabayashi et al. teach oxidizing a sacrificial layer to separate the substrate from the one or more structural epitaxial layers.

Applicant argues that Yonehara et al. and Miyabayashi et al. do not teach depositing a sacrificial layer on a substrate and oxidizing the sacrificial layer to separate the substrate from the one or more structural epitaxial layers deposited on the sacrificial layer.

The examiner agrees that Yonehara et al. and Miyabayashi et al. do not teach the entire claimed method of depositing a sacrificial layer on a substrate

and oxidizing the sacrificial layer to separate the substrate from the one or more structural epitaxial layers deposited on the sacrificial layer. Yonehara et al. and Miyabayashi et al. teach oxidizing a sacrificial layer to separate the substrate from the one or more structural epitaxial layers, whereas Ogawa et al. teach depositing a sacrificial layer on a substrate and separating the substrate from the one or more structural epitaxial layers deposited on the sacrificial layer. Therefore, combination of the references teaches the claimed structure.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Papers related to this application may be submitted to Technology center (TC) 2800 by facsimile transmission. Papers should be faxed to TC 2800 via the TC 2800 Fax center located in Crystal Plaza 4, room 4-C23. The faxing of such papers must conform with the notice published in the Official Gazette, 1096 OG 30 (November 15, 1989). The Group 2811 Fax Center number is (703) 308-7722 and 308-7724. The Group 2811 Fax Center is to be used only for papers related to Group 2811 applications.

Any inquiry concerning this communication or any earlier communication from the Examiner should be directed to *Examiner Nadav* whose telephone number is **(571) 272-1660**. The Examiner is in the Office generally between the hours of 7 AM to 4 PM (Eastern Standard Time) Monday through Friday.

Any inquiry of a general nature or relating to the status of this application should be directed to the **Technology Center Receptionists** whose telephone number is **308-0956**

O.N.
12/10/04

ORI NADAV
PRIMARY EXAMINER
TECHNOLOGY CENTER 2800